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Title: Impasse-Driven Tutoring for Reactive Skill Acquisition

Abstract:

We introduce a new approach to intelligent tutoring in performance-oriented training
environments based on a method called *situated plan attribution.* The aim of this method is
to provide contextualized tutoring for procedural tasks requiring reactive, goal-oriented
skills. We use the term *plan attribution* instead of *plan recognition* because it does not
assume that the problem solver is consciously executing plans. We avoid some of the
pitfalls of other popularly used methods, i.e., model tracing and procedure net grammars,
by selectively using an expert cognitive model to generate advice after detecting a problem
solving impasse. The tutor attributes a set of plans to the student based on a task
description. Each action is evaluated with respect to: the student's attributed plans, its
actual effects on the training device, and the contextualized goals associated with the plans.
Impasses fall into three categories: action constraint violations, unsatisfied goal violations,
and plan constraint violations, which is the weakest category since the tutor purposely does
not force students to follow an expected plan if they are able to achieve the task goal by
other means. Tutoring is *irnpasse-driven.* Once an impasse is detected, the tutor's expert
cognitive model resolves the impasse in the context of the current situation, i.e. the state of
the training device and the task goals. The expert cognitive model is capable of learning
and is thus often able to recognize the impasse and its resolution in the task context without
searching through a set of problem spaces. We have implemented our method in Soar and
are using it in a training system for communications link operators in NASA's Deep Space
Network (DSN).